

DYNAMIC & CYCLIC BEHAVIOUR OF BALLAST IN THE LONG TERM AS DETERMINED IN CEDEX'S TRACK BOX

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Key Words: *Railway track; ballast; high speed; experimental tests; computational methods*

ABSTRACT

The 6 cylinder servo-hydraulic loading system of CEDEX's track box (250 kN, 50 Hz) has been recently implemented with a new piezoelectric loading system (± 20 kN, 300 Hz) allowing the incorporation of low amplitude high frequency dynamic load time histories to the high amplitude low frequency quasi-static load time histories used so far in the CEDEX's track box to assess the inelastic long term behavior of ballast under mixed traffic in conventional and high- speed lines.

This presentation will discuss the results obtained in the first long-duration test performed at CEDEX's track box using simultaneously both loading systems, to simulate the pass-by of 6000 freight vehicles (1M of 225 kN axle loads) travelling at a speed of 120 km/h over a line with vertical irregularities corresponding to a medium quality line level.

The superstructure of the track tested at full scale consisted of E 60 rails, stiff rail pads (> 450 kN/mm), B90.2 sleepers with USP 0.10 N/mm³ and a 0.35 m thick ballast layer of ADIF first class. A shear wave velocity of 250 m/s can be assumed for the different layers of the track sub-base.

The ballast long-term settlements will be compared with those obtained in a previous long-duration quasi-static test performed in the same track, for the RIVAS [EU co-funded] project, in which no dynamic loads were considered. Also, the results provided by a high diameter cyclic triaxial cell with ballast tested in full size will be commented.

Finally, the progress made at CEDEX's Geotechnical Laboratory to reproduce numerically the long term behavior of ballast will be discussed.

(The research leading to this presentation has received funding from the European Union Seventh Framework Programme under grant agreement n° 265754)

References

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